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ABSTRACT

This report explores the use of videos to facilitate learning in a mathematics course for teachers developed by England's Open University. Specific video extracts are discussed from a psycho-analytic perspective on learning. The report first examines the course content and briefly discusses the use of video as a teaching tool. Then the psycho-analytic aspects of the course are examined, including descriptions and critical evaluations of specific video excerpts. These excerpts show learners working in a group within a class, that class being within the institution of a school. It is argued that just as videos provide the shape, position, and movement that define the most fundamental dimensions of physical reality and thus can aid learning, so the dynamics inherent in the group process can aid the teacher in locating those equivalents in human relationships and in so doing can increase the effectiveness of the teaching process. (Included are 9 references) (GLR)

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Teaching and Consultancy Centre

Report No 64

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A psycho-analytic perspective on learning through OU videos

by Robert Nicodemus

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3. **To provide consultancy and training,** inside the OU and on a contract basis with outside organisations, based on the staff's wide experience in distance education and open learning. On this same basis, to chair course teams and write course materials, and to 'transform' materials produced by external contributors into high quality distance teaching material.

FOREWORD

This report is based on a contribution to an OU course EM 236 Learning and Teaching Mathematics In the final review unit (12) of EM 236 video extracts are discussed from a psycho-analytic perspective on learning. An example of turning such material into a pack is considered in TCC report no. 65 Learning about learning in groups using OU videos.

A PSYCHO-ANALYTIC PERSPECTIVE ON LEARNING THROUGH OU VIDEOS

Introduction

The importance of television materials in distance teaching established through the OU /BBC partnership assured high quality and public exposure through Broadcasts from 1969. Of 137 undergraduate programmes available in 1992, 74% use TV Broadcasts and 43% use video cassettes. Broadcasts are usually 24 minutes and videos may be three hours in length. Because videos may be more closely integrated in the correspondence text they are extensively used in materials outside the undergraduate programme such as study packs.

The Centre for Mathematics Education (CME) has been very active in producing packs to support teachers. In the 1991 CME brochure Supporting Teachers of Mathematics, about one-third of twenty eight packs use video cassettes. These are also listed in the brochure Professional Development and Inset for 1991 -1992 produced by the OU School of Education. The School lists an additional twenty five packs and nearly half use video cassettes. This number does not include packs which are part of Certificate or Diploma programmes.

EM 236 Learning and Teaching Mathematics has six hours of video excerpts of classroom behaviour (in the age range 5 to 16) to help develop skills of observation, especially of one's own teaching practices. "Accounting for" events follow giving an "account of" them so that the basis of inferences and guesses about the causes of behaviour is clarified. Different perspectives are drawn upon including a psycho-analytic one in the final unit - the first time that such a perspective has been used in an OU course.

One year after the first (1992) presentation of EM 236, institutions (but not individuals) will be able to purchase the two 180 minute Working Videos from

OUEE (Open University Educational Enterprises). The 1991 price for Working Videos is about £80.

EM 236 is the first course to refer to Key Stages of the new National Curriculum when pupils are formally assessed. In England and Wales the Key Stages (KS) are related to the following ages - KS 1 (6-7), KS 2 (10-11), KS 3 (13-14), KS 4 (15-16). The four key stages may also be referred to as Year 2,6,9 and 11. Differences for Northern Ireland and Scotland are described in the Course Guide.

Teaching about teaching with videos

Some OU course materials are not planned. They arise out of opportunities which team members become aware of in their work together. A new contribution has to compete with space on it's own merits because teams always produce more materials than constraints of resources, as well as student time, can allow. This report includes the fifth draft of a contribution (Psycho-analytic perspectives) to the final review unit of EM 236 Learning and Teaching Mathematics. The fifth draft was improved through academic editing by Eric Love and Christine Shiu (chair). Final editing by Jenny Chalmers will lead to further impovements for publication. Comments also by Alan Graham, John Mason and David Pimm on the previous four drafts were very helpful. Also included in this report is a brief account of how this opportunity arose. Although the focus is on video excerpts, there is sufficient description of this material so that "Psycho-analytic perspectives" can be read on its own.

I joined the course team early in production to write the "Video notes" as well as read and comment on the draft units. In the summer of 1991 I was able to view "rough cuts" of all six hours of video excerpts of teacher-pupil interaction. The materials were so rich that I found it difficult to incorporate all my comments in the video notes. Because the course team wished to introduce a variety of

perspectives, including mine which they were already familiar with from earlier contact, I wrote up a separate draft titled "A video review". In this I related what I saw in the video excerpts to a view of learning influenced by psycho-analytic theory.

In the first course team meeting after the summer we discussed my video review. One member commented that I appeared to have created more work for them, that I had brought up many new points they had not included in their drafts. Because of the production schedule no extra time was available to develop drafts further. Another member commented on how valuable he had found my perspective. Perhaps I could develop it into a research article for publication. Soon we identified the possibility of including my video review in the final review unit and I was requested to turn it into a teaching document. It took four drafts to arrive at the present state. The experience of having a group of colleagues comment in detail on my writing was extremely helpful in clarifying my own thoughts. The experience was also a validation of the work I had been pursuing for the past thirteen years.

My interest in psycho-analytic methodology has been applied to a wide variety of situations outside as well as inside the OU. Mostly I have focused on facilitating team work with reference to the unconscious sources of dynamics in relationships at all levels of organization - individual, group and institution. A few years ago I had worked with the Centre for Mathematics Education to facilitate their team work and this contact had led to my inclusion in the EM 236 course team. This shared experience of an enquiry into an area of mutual interest was probably important in the trust necessary to include something quite new in an OU course.

Psycho-analytic perspectives

The video excerpts in the course provide a unique resource for learning, which written descriptions cannot begin to approach. The short excerpts help us focus in depth on a few aspects of teaching and learning behaviour. Because we can see only a fragment of a lesson, the variety of methods a teacher employs is rarely exhibited. In this essay I draw on sixteen (out of 41) excerpts to help describe a different perspective about learning which may be of practical use to teachers. The excerpts I discuss illustrate way of 'reading' classroom incidents from a perspective which encourages the harmony between cognitive and affective dimensions of learning.

Some of the behaviours considered may, on the surface, seem opposed to learning; but experiencing conflict or being stuck in dead-ends or confusion about one's identity are all essential to learning. The dynamic aspect of learning is maintained within a number of tensions such as that between thinking and action. These tensions may be experienced as positive (exciting) or negative (threatening). What is important for teachers is to understand their own responses to the complex situation of the learner.

The framework I will use here for analyzing and reflecting on the excerpts is related to psycho-analytic theory and method. The popular image of the method involves a single patient lying on a couch and saying whatever comes to mind (free association) to an analyst. What is used here is the less familiar application of psycho-analytic ideas to groups and institutions, in this case to classrooms and schools.

Psycho-analysis is primarily a study of how unconscious influences are formed and re-enacted in the present through our relationships. It is easy to lose sight of some of the infantile origins of behaviour, in both children and adults, as they are progressively concealed by induction into groups and institutions. We

consequently lose insights into what inhibits as well as facilitates learning. Recognizing unconscious attitudes which are influential may help teachers in planning as well as in responding within the pressures of a busy classroom. Psycho-analysis has its own technical vocabulary which is usually not appropriate in work situations so technical terms are only introduced when essential. However it is important to understand the language if you wish to explore the literature.

In taking a psycho-analytic view of learning there are often parallels which can be drawn between the subject matter being studied and ideas about one's self, desires and change. For example, using the geometric notions of shape, position and movement the parallel might be:

1. shape - Clarity about one's self and abilities

2. position - Awareness of aims and desire, thoughts and action.

3. movement - Openness to change and development.

and positive learning experiences in geometry can be read as directly beneficial to the sense of self.

Nevertheless it is possible and important to look positively at difficulties in learning that involve perhaps loss of clarity about for example boundaries, thinking and change. When learning appears most difficult we need to understand how pupil's anxieties and fears cause them to retreat to earlier (childhood) solutions. There may be fears about separation from another (as the baby from the mother), or confusion of thought with action or change with destruction (as when the young child guiltily believes that angry thoughts will cause harm to their object). Focusing on three levels of development (self,

desire, change) may help identify some events which are particularly important, though often the three levels are interdependent and then a focus on transitions between them may be more useful.

In viewing many of the video excerpts I noticed the importance of having some idea of the shape of an object (e.g. video excerpts 34, 37 and 41). This idea has an internal reality which can be and is altered, largely through interaction with other people. Shape is a very widely used concept which reaches into history and the arts, where 'the shape of things to come' or 'the shape of a play' which unfolds may be spoken of. Shape is also used as a metaphor for physical or psychological condition e.g. 'not in good shape'. The idea of space takes us into questions of where events are located (their position). Is an experience based in the body (sensations and emotions) or based in the mind? Does the ability to be aware of and experience depend on the integration of both body and mind? Movement introduces the idea of change and the problem of distinguishing imagination from reality. By relating our internal reality to external reality we make a number of transitions from body to mind (e.g. sensation to idea) and from mind to body (e.g. thought to action).

Shapes and spaces

Symmetry is a phenomenon so familiar that it rarely attracts comment. The approximate bilateral symmetry of our own bodies and the radial symmetry of many flowers are taken for granted. Both kinds of symmetry are encountered in the first two video excerpts to be discussed.

In video excerpt 35 Symmetries two boys are handling two solid shapes, one large and complex and the other a smaller rectangular shape referred to as a 'spare piece'. The task is to place the spare piece in a position so that the entire shape becomes symmetrical. Because of the complexity of the object it is not at all

obvious how to balance the two halves. The teacher demonstrates how to find the axis of symmetry with a mirror placed so it reflects just half of a symmetrical shape drawn on paper. One child yawns and taps the edge of the mirror on the shape with some force - a typical way of expressing frustration. The most difficult aspect of the task for the boys seems to be (simultaneously) keeping in mind the reflection they see in the mirror and imagining where the spare piece must be placed behind the mirror to make a symmetrical shape. Visual perception and creative imagination are linked from our earliest experiences of life. When something we have experienced is hidden, an image or symbol must be created to represent the absent object to keep it in mind and maintain a continuity of relationship in space and time. Absences associated with someone (or something) which is valued are initially difficult to accept and frustration occurs. Creative ideas can be implemented when one believes in their own capacity for reparation - to heal the feared consequences of bringing opposed (ambivalent) feelings together, that one may love as well as hate the same person.

There are two important points to be made here. These are first, that, for any individual, even a simple task may have many unsuspected associations, and second, the task may evoke mixed feelings about relationships outside a classroom. Ambivalence about relationships is closely linked with early experiences (such as the presence and absence of important figures) and may inhibit as well as facilitate learning.

Shape, position and movement are physical aspects of experience which, without our awareness, may have strong associations with emotions. A child unable to complete a task about symmetry may express this block in learning through their body by over-excited or lethargic responses. Focusing in detail on one aspect of behaviour (self, desire, change) may help us locate the difficulty more precisely.

In the next example the difficulty of comparing the position of one object with another may be related to the importance of being centred within oneself inside a familiar context.

In video excerpt 38 Transformations the idea of mirror image is taken further and connected with both position (defined relative to x and y axes) and movement (angular rotation). A girl, Rosina, is presented with two drawn triangles and she has to determine if one has been flipped over (giving a mirror image) or rotated in relation to the other. The challenge seem to lie in the orientation of herself relative to the triangle as a means of thinking about the task. She demonstrates that she understands the idea of rotation by turning one triangle, but the jump from comparing positions to a quantitative estimate of the angle of turn seems difficult for her. It may be blocked by feelings of vulnerability, lack of confidence or self doubt. The teacher emphasises the importance of keeping a fixed point in mind around which a line rotates but Rosina does not appear to be pleased or relieved when she says she understands. It is possible, perhaps probable, that the focus of a camera on her struggles probably makes this a very uncomfortable experience for her.

In additional to providing emotional support, teachers often help children over learning difficulties by encouraging them to focus on a limited amount of information. In video excerpt 39 Now you see it the teacher suggests that the children use just a few colours to show how a large shape is made up of small shapes.

In video excerpt 21 Counting cubes the focus is no longer changes in position but quantitative changes in the size of an object. Children are asked to compare how an 'L' shape made up of cubes increases in size. They seem confused about what measurement - linear, area, or volume - to use in describing increase. As the

lesson progresses they appear to become increasingly disoriented and unsure what to measure. It may be worth commenting here on the frequent preference for dealing with something that increases rather than decreases. This may be related to preferences for positive over negative numbers. Negative numbers might unconsciously be linked to negative emotions - 'increasing' is better, 'positive' *is* positive. If ideas with negative associations are avoided or neglected in tasks, their power and possible effects on learning are also ignored.

The constraint of not touching or manipulating objects can add to the difficulty of a task. In video excerpt 34 Great Dodecahedron children are asked to describe a complex shape without even pointing to it. It is hard to describe something at a distance because reference points have to be constructed and clarified. Nevertheless such challenges are often experienced as very positive. Indeed many learners may be attracted to mathematics just because it allow them to escape from woolliness and ambiguity by focusing on specific shapes, numbers and procedures. But there are also opportunities for more artistic activity as portrayed in video excerpt 32 Tie and dye. In contrast to the geometrical precision of the Dodecahedron, children attempt to make a particular shape on a cloth by tying. They guess or use informal reasoning in order to predict intuitively how they need to tie it before dyeing it to get a particular effect.

Emotions

The geometrical notions of structure and boundary have their psychological and emotional counterparts. Affective structures and boundaries develop - or are weakened - through the dynamic tension between reason and emotion. Without emotion, reason may lose touch with desire and hence with any impetus for action. Clarity about differences between imagination and reality, thought and action, self and other is lost. Behaviour regresses from allowing change to resisting it, from welcoming encounters to fight or flight from them, from

empathy to denial of responsibility. From the perspective of these possible extremes, we may place ordinary learning in a broader context. In the next video excerpts emotional associations and their impact on learning appear to be strong and involve the notion of boundary between self and others.

In video excerpt 25 Dividing the class the teacher asks the children to divide their class into two sub-sets so that all the members of each sub-set will have one thing in common. Some children choose hair colour - light and dark, others, for example, select whether or not children go home for lunch. But they experience difficulties with their classifications - not all the members of the class are included or they get three sub-sets instead of two.

The use of very personal attributes for an abstract classification task may have become a source of confusion. Hair colour is just one of many characteristics children see in each other and just to select one attribute out of all those possible means that many others are left out. The separation of inside from outside is of fundamental importance in developing a clear sense of self. The notion of food as something taken inside oneself may lead to some (figurative) hiccups when it is used associated with the idea of some children going outside, that is home for lunch. These speculations suggest how different the experience of dividing the class might be for one child (who is inside or outside of a particular set) compared to others. The challenge for teachers is to learn to recognize the evidence for how a situation is or might be experienced differently by different pupils.

Emotions associated with competition may also get in the way of what a teacher intends. In video excerpt 12 Accommodation base 4 children are throwing a dice to see how many windows they get. When they have four they can exchange them for a house. Four houses can be exchanged for a street. The game is set up

to allow the children to cooperate, but they become excited about obtaining higher numbers and getting more windows. One child suggests there is a battle going on.

Emotions are sometimes exciting, but can be alarming and may then incline people towards a preference for relatively static situations rather than dynamic changing ones. In video excerpt 41 Rolling shapes the children are asked to describe both the static physical attributes of an object (such as the number of faces it has) and how it moves dynamically (e.g. rolling in a straight line or circle). The teacher then hides one object from a selection and asks the children to work out which one she chose by asking questions about its properties. Their questions focus only on the number of faces the object has and not on whether or not it rolls. Perhaps the movement of objects seems very transient and difficult to keep in mind compared to a static quality which can be measured or counted.

To control or slow down possible change, boundaries must be clarified and the resulting sharpness in distinction between what is inside and what is out carries negative feelings of inclusion and exclusion. Conversely, when boundaries become unclear and their function of mediating between two separate things (self and other) is lost, confrontation also seems to be avoided in one's imagination. The result is that memories of the past or progress are lost and ideas about responsibility for the future avoided.

Parts and wholes

Another mathematical notion with psycho-analytic parallels is that of parts and wholes. What could be more simple than starting with just straight lines and circles to make a world of shapes which one can change? Such a complete world within itself might well be described as "hermetic". The Greek God Hermes is associated with the occult, magic or hidden sciences i.e. a world cut off from

outside views. In video excerpt 33 Tak-tiles, two girls are giving values to the area of a complex shape by dividing it into smaller shapes. Within this limited domain or world the basic shapes (and their areas) are represented by letters (a, b, etc), which in turn are linked by operations (addition or subtraction) and written in particular sequences (indicated by brackets). The expressions generated are more abstract than the physical attributes of the shapes to which they refer.

Difficulties with the task may be increased by emotional associations with parts and wholes and with the transition from physical attributes to abstract symbols. For example, towards the end of the excerpt one girl refers to a missing 'number' rather than a 'letter'. This may reflect difficulties in keeping clear transitions from wholes to parts and from values to symbols. To think about parts of a object, as well as the whole, may be particularly difficult for some children, especially if keeping things the same or whole has some emotional significance. Gaining confidence to create abstract ideas may be entwined with personal relationships in a confusing way. Operating on shapes and changing them invokes possibilities of constructive or destructive actions and problems about locating the source of the action.

One tension inherent in living is the contrast between engaging spontaneous behaviour and reflecting on experience. When acting spontaneously time is suspended - there is only the now of the action; when reflecting, past and future come together with the present. This transition between 'no time' and 'infinite time' can oscillate so rapidly that it is difficult to maintain a sense of self, of the shape of things and of desired changes. The idea of boundaries draws attention to how transitions may be modulated so that oscillations may be slowed down as more thoughtful alternations occur - in positions inside or outside, between thinking or acting, about a world which is both imagined and real.

Subjective space

The next video excerpt I chose to comment on takes us further into awareness of how the significance of a situation may be based in another time and space, in the past outside of school. The distinction of what is inside the self and what is outside helps us see how empathy links one person with another through a process of projected feelings. The movement from empathy to competition may be related to that of change in position from identifying with another person (putting oneself in their position) to wanting to get the better of them (a position in front or on top, wanting to be bigger or 'more than' in any way possible).

In the first part of video excerpt 1 Teddies and shapes, the teacher asks the children to choose a teddy each One girl, Amy, says 'yellow and yellow' as she picks up two teddies but is hesitant to answer when the teacher asks her to describe them. Amy tells her teddies to sit and stay and then lifts them in the air. As the teacher continues to question Amy, another girl, Jessica, tries to help by suggesting "light and dark yellow" as a response to the teacher.

In this deceptively simple situation we can see many of the important features of any learning situation. The task set by the teacher is part of a context which is safe and supportive. For most of the children selecting a teddy and describing colour (as a basis for selection) is not difficult. But Amy, who talks to her teddies, appears to be engaged in telling a story linked to some other time and place. We can only guess about what she is feeling and thinking but it is important to try to understand her context. Perhaps Amy has in mind the family she left in the morning and which she looks forward to returning to. Associated with these memories are her parents and their roles. She may be imagining herself in a parental role telling the teddies what to do and making a nice safe place for things to happen, rather like the teacher is doing.

Jessica offers an answer to the teacher's question, perhaps concerned that Amy does not know enough answers. We see here the basis of empathy, being able to identify oneself with another and wanting to help. Through these spontaneous behaviours we can begin to infer more about the complexity of inner experience of children in school. For example, there are two sources of authority in competition here and which may sustain some of the dynamics. For Amy there are, perhaps at an unconscious level, parental roles. For the teacher there are professional objectives which may produce unexpected and difficult-to-understand responses because of unconscious influences.

The second part of the excerpt focuses on five children who are a year older - Joanna, Zoe, Lorna, Daniel and Jason. The teacher asks them to select a 'logi-block' and to describe it. She encourages their awareness of four different attributes - size, colour, thickness and shape - and expresses surprised approval when pupils identify three and then four attributes of their block. She leaves them to continue with a 'domino' game in which shapes are added to a line linked by a shared attribute, and have to be described as they are placed in position.

In her absence the girls appear to be delighted to assume the teacher's role, encouraging and then requiring Jason to describe more attributes of the shape he has added to the others on the table, echoing the teacher's words 'and something else?' Daniel suggests, apparently with some feeling, an answer to help Jason. It is not obvious what that feelings is - humour, breaking rules, embarrassment, joining forces or some combination of these.

At this point it might be worth delving a little into your own spontaneous associations with Teddies and shapes when you first viewed it and speculate

about past experiences which are no longer in conscious memory. It is important to learn about aspects of one's own responses in order to appreciate difficulties others may have in learning. In particular, bridging generation and gender gaps requires constant reflection. How did you feel when the girls appeared to identify with the teacher's role? Were you reassured by the girls' support for group learning or irritated by what might have been impulses to competition or dominance? Were you sympathetic towards Jason or pleased when Daniel supported him? To what extent does your own gender influence the questions you stress?

It is easy for experienced teachers to see a particular task simply as a means to promote learning and not to recognize or acknowledge their own associated feelings. Although watching children in these videos can be very pleasant, children do not hide their feelings like adults and their directness may sometimes be uncomfortable. In order to avoid making premature judgements as teachers, we need to be in touch with our own, often, mixed feelings. Otherwise, hasty decisions may be made under the influence of suppressed anxieties which affect the reality of the situation one is attempting to understand.

The move from pupil to teacher is a move into a new generation. 'Inside' experience as a pupil is now one of 'outside' observation. Perhaps, too, the girl talking to her teddies is feeling a little outside, compared to the family she recently left. The softness of the teddies may be important as a source of comfort and reassurance.

Teachers also make a transition from their personal experiences to their professional role. In the videos there is evidence of the authority of teachers being exercised in different ways, and being experienced differently by individual learners. Pupils may experience authority as reassuring or boring or oppressive.

Part of the art of teaching is being tolerant and patient with the struggle to learn from a position of authority.

Creativity and regression

In the previous sections possible examples of confusion, conflict and stasis (preventing change) have been identified. These phenomena can be interpreted as defenses against anxiety. In education it can be more helpful to see them as evidence of learners' struggle to clarify and test out the reality of their fears. Collusion (pairing up with someone) to prevent change, may be evidence of despair, a lack of hope that anything better is possible, a lack of faith in the potential of a new idea. Internally, there is always a struggle between wishing to find the truth and facing the consequences of finding out. External pressures may support avoidance in this struggle. By contrast, a declared or demonstrated belief in the possibility of development reflects an inner state where structures or boundaries are sufficiently clear to tolerate the negative and positive aspects of experience. A person with such a belief has trust in the validity of their feelings and an expectation that others will take them seriously. They have a clear sense of self - how one is separate and different from others - and an increased ability to sustain efforts towards what is desired and valued. Openness to taking risks will be tempered by a full awareness of potential consequences, not the least of which will be disapproval for not conforming to what has been established.

In situations where error or emotion are not supported or seen as experiences to learn from, there may be some resistance to engagement with tasks. In video excerpt 16 Linesman, thinking about negative numbers appears to be unexpectedly difficult. The teacher introduces a human stick figure standing on a line and facing right, that is in a positive direction. The class is encouraged to think of a negative number in terms of behaviour, with the figure facing in the

opposite direction or walking backward. It is possible these terms have unintended associations which are difficult for learners to contain. Physical 'opposition' may become equated with conflict, or focus on negative aspects of experience discouraged.

In video excerpt 17 Graphical calculators, two girls are comparing written equations with their representation as a graph. The girl on the left of the picture says little, while the one on the right comments almost continuously on what is happening. Perhaps the first girl does not understand and does not feel confident or safe enough to ask questions or reveal her lack of understanding. She enters data in her book - perhaps mechanically in a attempt to obscure her difficulty. She moves the calculator and allows it to fall with some impact - a physical outlet through the body, which can be read as a hint of frustration and anger at the intellectual blocks she is experiencing. Perhaps at some level, probably unconscious, she might like to break the calculator into fragments - an acting out which would reflect how she feels internally. It is possible to pursue this line of speculation further as the teacher enters. Might girl 1 be reinforced in her frustration by the attention the teacher gives to the girl who appears to understand better, and receive an unintended but strong message that (only) clever pupils get rewarded Since we only see a small fragment of the lesson, we cannot conclude that this message is consistently given to the girl - only that it appears to be so at one moment and that it may affect her experience in that moment.

Another example involving boundaries, both physical and personal, can be seen in video excerpt 37 Back into shape . Triangular-shaped prisms are fitted into cubes to make a greater variety of shapes. There are different kinds of boundaries, external and internal - those around solid objects and others inside hollow objects. In an effort to help the pupils their teacher describes a solid

shape as a 'true' triangle and distinguishes it from a triangular space which he calls an 'interior' triangle.

Boundaries are often difficult to think about because they are so important in defining structures and distinguishing between, e.g. self/other, mind/body, imagination/reality. Inside and outside also have emotional association. We do not want to be left outside or exclude. For infants and adolescents the emotional aspects of boundaries are frequently being re-defined by being expanded from those of home to those of the 'extended family' of groups within institutions.

Sometimes active behaviour may conceal a covert aim to avoid change. Often such activity is characterized by having a beginning and end but no middle - the 'place' for thinking and exploration has been excluded. Thus 'practicing more (and more) examples' may become a circular process which does not go anywhere. Two excerpts offer possible hints of this process. In video sequence 14 Divide and share pupils are demonstrating division by partitioning sets. They continue to practice although at least one of the three girls seems already fully competent. The transition from thinking (negotiating boundaries) to effective action involving change can be a difficult one. It is easy to become stuck in an activity which merely seems to multiply experiences without purpose.

Similarly questions arise from video sequence 19 Number squares which begins with the task of showing that a perimeter increases by eight new squares with each new concentric layer. After some counting of the squares in a number of layers, the teacher asks pupils to decide without physically counting how many squares would be in layer number thirty. The pupils get out their calculators but appear to be stuck in multiplying increasingly large numbers without any idea of how to judge the end point or how to arrive at a correct answer. One child resorts again to counting the squares.

Groups and institutions

All the video excerpts show learners working in a group within a class, that class being within the institution of a school. In this section of the essay I describe some general notions about groups and institutions.

In social encounters people carry within them ideas about what things are, what may happen to them and what the significance of change may be. Our ideas are constantly being tested out because they anticipate the future from a perspective of the past. There are two view points about creative change. The first view acknowledges that we are sometimes not consciously aware of why we do things or even that we do them at all. The second view point focuses on aspects of our environment of which we are consciously aware. This view is sometimes used to refute the existence of unconscious processes but the two view are complementary as well as necessary to creative institutions. The unconscious side may be expressed in a number of ways. For example, personal responsibility is avoided because someone else is given all the authority (dependency on a leader), actions are taken instantaneously (fight/flight), imagination not tempered by reality may soar off into shared delusions (pairing) of immortality, power and grandeur.

Rapid reversals in relationships are common when structures are being clarified, as if we need the contrasts provided by the polarizations. Institutional structures provide a focus for conflict at the boundaries so that anxieties about developing interdependence may be tested out. The opportunity to test out our anxieties through personal relationships within a group will support the development of that group and enhance its effectiveness.

Institutions may provoke some of the excesses described above, in part because of our ambivalence towards authority, whether to be either dependent or autonomous. 'Either/or' thinking is typical of situations where there is no safe place for exploring feelings. When dealing with individuals structures may evolve within each person through the relationships between themselves. By contrast, in institutions, structures appear relatively fixed and permanent, existing independently of individuals and reminding them of their vulnerabilities or mortality. However evidence which supports the second point of view about creative change is provided by the fact that in the longer context of historical time, institutions also evolve through human intention and intervention.

Institutional structures provide a focus for tensions in relationships at work. Clarifying and working through anxieties about relationships becomes more important as the complexity of living in a technological world increases. Unconscious processes may be recognized in classrooms as learners struggle towards independence or as leaders attempt to manage the boundary between a group and what lies outside it, e.g. a team within an institution or a school within a community. What we learn about learning can be applied to every level of relationships within institutions.

The personal world is a timeless one of immediate, direct and spontaneous relations reacting in the moment. The symbolic world of language (verbal and non-verbal) is less direct and more reflective about past and future as well as present. Reflection can be idealized as a more objective view of the situation reflected on but it acquires reality only as we take account of emotional experiences. True reflection stays in touch with the negative and painful as well as the positive aspects of experience. A person's loss of a sense of time or history may be evidence of a loss of boundaries, disorientation of the self and loss of

capacities. In contrast, history can be treated as some absolute determiner of events where no one can be held responsible for anything. The more we understand about the complexity of the spaces we live in, the more we will be able to enable learning.

Teachers help learners to see questions such as 'is it enough?' or 'is it right?' as not inviting judgements about end points but as pointers on a journey. Without sensitive and aware support children may find it difficult to think about ideas, such as algebra, which are potentially powerful in their implications for change.

In conclusion

This essay has explored how some mathematical terms can be taken as analogies for aspects of the psycho-dynamic. Content which is unfamiliar may be reassuring or threatening, depending on how internally integrated are one's capacities and how integrated one is within an environment.

The ability to keep in mind polarities depends on being able to contain ambivalent, conflicting feelings; containment in turn requires a belief in one's own capacity for creativity, power or authority. The spontaneous creation of ideas requires commitment to the unknown and risk-taking rather than rigid conformity to a plan. In contrast, denial of ambivalent feelings, or keeping relationships fragmented, blocks the possibility of renewal of energy or hope.

Teachers know that it is good practice to clarify objectives, plan activities and share evaluation of achievement with learners. Ideals, authority and disappointment are all bound up in this. There are also unplanned outcomes, emerging from the tensions of a learning situation. Then experiences must be modified and new meanings worked on. Allowing time for meanings to evolve, for experiencing the frustrations of learning and sharing new directions are

aspects of the two way interaction between learner and teacher. The mystery and power embedded in this authority-dependence relationship will always provoke a number of feelings from unquestioning acceptance to rejection, or from conflict to passive resistance.

For very young children, their emotional and psycho-dynamic world is near the surface and it is relatively easy to see the importance of these factors in their learning. Adolescents and adults have usually learned to mask these dimensions and it is easy for the teacher to assume that they do not exist or are not important.

Education provides unequalled opportunities to enquire into the dynamics of development but it does take discipline and commitment. Neither teaching nor enquiries into unconscious processes can be learned entirely from books Books can help, but not replace, the resources of a supportive group and the unique insights available from each individual within the group. Insights informed by critical observation and awareness of dynamic processes, especially at an unconscious level, help teachers place the learner in a broader context. Thus the impact of family, pupils, class and school can be understood and decisions made about what to do and, just as important, what not to do.

Shape, position and movement define the most fundamental dimensions of physical reality. Their equivalents in human relationships - ideas about one's self, desire and change - are equally fundamental Awareness of them helps the teacher locate the child relative to the material to be learned and hence to find the tasks which will shape the journey.

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